

REMARKS

Claims 1-28 are pending in this application. Claims 11-19 and 24-28 have been withdrawn from consideration as being directed to non-elected inventions. Of the pending claims, claims 1, 3-10, 20, 21 and 23 stand rejected under 35 USC §102(e) as being anticipated by Seaba et al.; claims 2 and 22 stand rejected 35 USC §103(a) as being unpatentable over Seaba et al. in view of Valensa et al.; claims 1, 4-6 and 8-10 stand rejected as being unpatentable over Eguchi in view of Hunter et al. Also, claims 3 and 23 stand rejected under 35 USC §112, second paragraph, as being indefinite for the reasons set forth on page 2 of the Office Action. Claim 8 has been objected to because of an informality.

In view of the preceding amendments and the following remarks, these rejections are traversed, and reconsideration of this application is respectfully requested.

The informality identified by the Examiner has been corrected in dependent claim 8. It is therefore respectfully requested that the objection to this claim be withdrawn.

Dependent claims 3 and 23 have been amended above to state that all of the catalysts are selected from the group identified. It is therefore respectfully requested that the §112, second paragraph, rejection be withdrawn.

Independent claims 1 and 20 have been amended above to specifically state that the first water-gas shift reactor is coupled to an inlet end of the heat exchanger by a connector and the second water-gas shift reactor assembly is

coupled to the outlet end of the heat exchanger by a connector so that the water-gas shift reactor is a single unit. Support for this can be found in figure 2 and the related text, where it states that the first stage WGS reactor 52 is coupled to the heat exchanger 60 by a connector 56 and the second stage WGS reactor 68 is coupled to the heat exchanger 60 by a connector 70. Figure 2 shows the WGS shift reactor assembly 48 being a single unit. By making the first and second stage water-gas shifter reactors and the heat exchanger a single unit, various housing walls, plumbing, etc. can be used as parts of multiple devices so that the size and weight of the water-gas shift reactor assembly can be reduced over those hydrogen gas reforming systems where the water-gas shift reactors and heat exchangers are separate units.

Paragraph [0011] of the specification talks about reducing the size and mass of fuel processing systems to satisfy vehicle weight and size requirements. Applicant respectfully submits that the prior art of record does not teach or suggest a single unit water-gas shifter reactor assembly, as now more particularly claimed.

U.S. Patent Application Publication No. 2002/0168307 to Seaba et al. discloses a fuel processor for processing hydrocarbon fuels as shown in figure 1. Applicant reserves the right to swear behind Seaba et al. under § 1.131 to remove Seaba et al. as a reference if a rejection of Applicant's claims is maintained under Seaba et al.

The Seaba et al. fuel processor includes a number of fuel processing elements known in these types of systems for providing hydrogen gas to a fuel

cell stack 68. These elements include in order of hydrogen reformat gas flow, a heat exchanger 30, a steam reformer 34, a heat exchanger 38, a WGS 42, a heat exchanger 46, a WGS 50, a heat exchanger 54 and a preferential oxidation reactor 60. Each of these elements is a separate element in the fuel processor disclosed by Seaba et al. The Examiner has separated the WGS 42, the heat exchanger 46 and the WGS 50 from the string of elements as being applicable to Applicant's claimed water-gas shift reactor assembly. Seaba et al. talks about a specific heat exchanger 300 shown in figure 1b including volumes 301 and 302 on opposite sides of a separator 303. Figure 3a shows a wavy plate separator including a wavy plate 320 having a catalyst material 324, which apparently can be used as the heat exchanger 300.

Applicant respectfully submits that Seaba et al. cannot anticipate independent claims 1 and 20 as amended because the WGS 42 and the WGS 50 are not coupled to opposite ends of the heat exchanger 46 by connectors. Further, Applicant submits that Seaba et al. cannot anticipate independent claims 1 and 20 because the WGS 42, the heat exchanger 46 and the WGS 50 are not combined as a single unit. Clearly from the discussion in Seaba et al. each of the WGS 42, the heat exchanger 46 and the WGS 50 are separate devices as shown in figures 1A-1D.

Further, Applicant respectfully submits that there is no teaching in Seaba et al. that the WGS 42, the heat exchanger 46 and the WGS 50 can be combined by suitable connectors into a single assembly. Therefore, Applicant submits that

Seaba et al. does not provide the teaching necessary to make amended independent claims 1 and 20 obvious under §103.

U.S. Patent No. 5,221,524 issued to Eguchi discloses a system for producing hydrogen from a reformat gas 3. The Examiner has directed Applicant's attention to figure 3A showing a high temperature shift converter or reactor 1a, a heat exchanger 5 and a low temperature shift converter or reactor 7. As with Seaba et al. above, the reactor 1a, the heat exchanger 5 and the reactor 7 are separate units, and there is no teaching in Eguchi that these elements can be combined using suitable connectors into a single unit. Therefore, Applicant submits that Eguchi fails to make obvious Applicant's independent claims 1 and 20 for the same reason as Seaba et al.

U.S. Patent Applicant publication No. 2004/0089439 to Valensa et al. discloses a heat exchanger 50. It is believed that the Examiner is relying on Valensa et al. to teach bar/plate type heat exchangers and tube and fir type heat exchangers. Applicant submits that Valensa et al. does not teach a combination water-gas shift reactors and a heat exchanger coupled together as a single unit, as discussed above. Therefore, Valensa et al. fails to provide the teaching missing from Seaba et al. to makes Applicant's claimed invention obvious.

U.S. Patent No. 4,288,346 issued to Hunter et al. discloses a catalyst for a catalytic heat exchanger. It is believed the Examiner's relying on Hunter et al. to teach providing a catalyst within a heat exchanger. Applicant respectfully submits that Hunter et al. does not teach a water-gas shift reactor assembly including combined water-gas shift reactors and a heat exchanger, as discussed

above. Therefore, Hunter et al. fails to provide the teaching missing from Eguchi to make Applicant's claimed invention obvious.

In view of the amendments and discussion above, it is respectfully requested that the §102 and §103 rejections be withdrawn.

It is now believed that this application is in condition for allowance. If the Examiner believes that personal contact with Applicant's representative would expedite prosecution of this application, he is invited to call the undersigned at his convenience.

Respectfully submitted,

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